ME3023

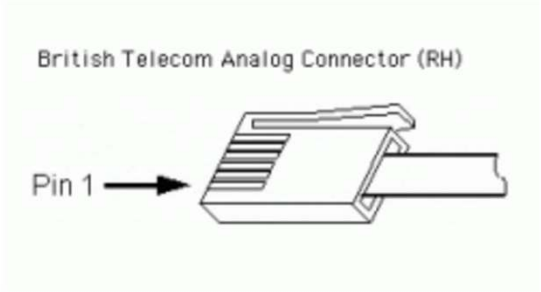
Challenge 7 Force Gage Calibration

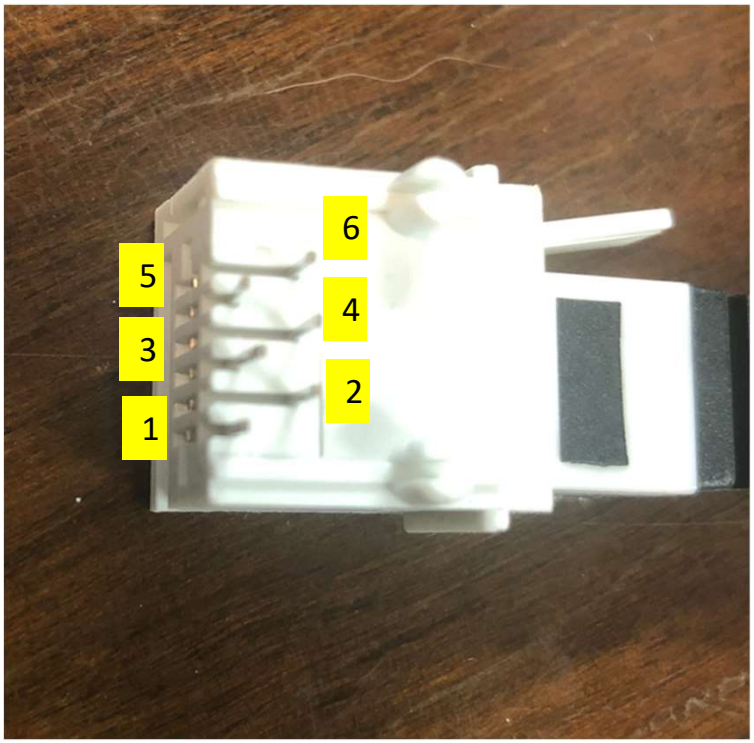
Setup

Equipment

- Base plate, long rod, short rod, and clamp
- Vernier Dual Range Force Sensor
  - And adapter with pin-outs for cable connections
- Brass Slotted Mass Set and hangar
- Multimeter or Oscilloscope
  - Your choose! Explain your choice
- DC Power Supply
- BNC to alligator clip cables, banana cables
- Small wires as needed

Equipment Setup – Pinout Guide





ANALOG SENSORS

- Pin 1 = Sensor output (+/-10V)
- Pin 2 = GND
- Pin 3 = Vres (resistance reference)
- Pin 4 = AutoIDENT
- Pin 5 = Power (+5VDC)
- Pin 6 = Sensor output (0-5V)

https://www.vernier.com/engineering/arduino/analog-and-digital-sensors/

Sensor Output – which one to use?

SJP: In the video, I set the gage to the slide switch of +/- 10 Newtons range

- Pin 1: (+/- 10) Volts output
  - This means the max voltage we get for tension (pull on the sensor) or compression (push on the sensor) is
    - +10 V output to correspond to +10 Newtons
    - -10 V output to correspond to -10 Newtons
    - We can only apply + load, so we would be calibrating one side of the sensor
  - I did NOT use this pin in the Video of Setup and O-scope readings
- Pin 6: (0-5) Volt
  - I DID use this one for the Video of Setup and O-scope readings
  - Recall with no load, the sensor read out ~2.5 Volts, midway through the range
  - And we saw a reduction in voltage output down to ~0.5 Volts for the 1000 g load
  - *One might assume* that if we *compressed* the sensor, it would indicate 4.5V

Pin 1

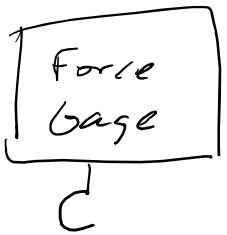
± 10 Volts

20 Volt range

Pin 6

0-5 V

5 V range

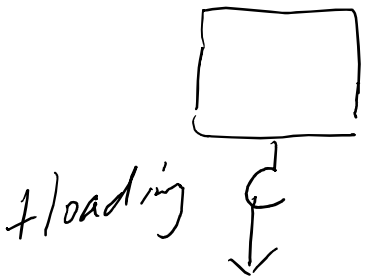


no load $+0$ Volts

Assume ↗

$+2.5$ Volts

↗ Verified (video)



+loading ↓

↓ +

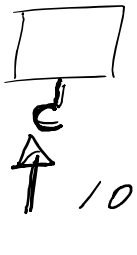
{ ? we haven't seen data }

0.5 Volts

↗ verified (video)

$m = 1000\,g$

$N - mg = 9.81\,N$



not our loading

↑ −

{ ? }

4.5 Volts

↗ assumed